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Experimental Facilitation of the Sensed Presence: Possible Intercalation between the Hemispheres Induced by Complex Magnetic Fields

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This experiment was designed to test the hypothesis that the sensed presence, the feeling of a proximal sentient being, can be evoked within the laboratory. Under double-blind conditions, 48 university men and women were exposed to weak (100 nT to 1 μT), complex, pulsed magnetic fields that were applied primarily over the right temporoparietal region, primarily over the left temporoparietal region, or equally across both hemispheres (one treatment per group) for 20 minutes while wearing opaque goggles in a very quiet room. A fourth group was exposed to a sham-field condition. Subjects who received greater stimulation over the right hemisphere or equal stimulation across both hemispheres reported more frequent incidences of presences, fears, and odd smells than did the subjects who received greater stimulation over the left hemisphere or who were exposed to the sham-field condition. The results suggest that the sensed presence is subject to experimental manipulation. This experimental procedure could be employed to explore the idea that the experience of a sensed presence is a resident property of the human brain and may be the fundamental source for phenomena attributed to visitations by gods, spirits, and other ephemeral phenomena.

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The principles of modern neuroscience predict that all experiences, from the perception of a sunset to the feelings of love, are associated with neuroelectromagnetic patterns that occur within brain space. The reliable elicitation of experiences by insertion of a very focal electrical current within the brain (Gloor et al., 1982) is congruent with these principles. We (Cook and Persinger, 1997; Persinger, 1999a; Richards et al., 1993; Tiller and Persinger, 1994) have been developing experimental procedures to interact with and modify this neuromatrix by applying temporally complex, low-intensity magnetic fields through the head. The initial purpose of this research was to understand the neuroelectromagnetic basis of the human sense of self. During this pursuit, we found that application of specific patterns of complex magnetic fields over the right hemisphere, in most healthy right-handed people, resulted in the experience of "another consciousness" (Persinger, 2000).

We (Persinger and Makarec, 1992) have suggested that this sensed presence, defined as the feeling of an entity or a sentient being proximal to the experient, is a normal phenomenon that has been prevalent historically and cross-culturally (Persinger, 2000). According to this hypothesis, the "presence" emerges because of the organization of the human being's two cerebral hemispheres and is the basis of experiences attributed to visitations by gods (Jaynes, 1976), aliens (Persinger, 1993, 2000), and other beings (Evans, 1984). From this perspective, the sensed presence is the transient awareness of the right hemispheric equivalent of the left hemispheric (linguistic) sense of self (Joseph, 1982).

After culturally determined verbal labels, such as God, Allah, an angel, or a spirit, have been applied to the sensed presence by the experient, the details of these labels are expected to affect the configuration of the memory during reconstruction of this autobiographical experience. These labels might also affect the causal attribution of the experience. From this perspective, the rich detail associated with the reconstruction of an experience of the sensed presence would be influenced by the same process as any other form of autobiographical memory (Fink et al., 1996).

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The neuroelectromagnetic timing and the metabolic patterns that generate the sensed presence must be prevented tonically. If they were not inhibited persistently, the experience would be continuous. At present, we assume that the major structural correlates, by which the impedance of specific right hemispheric processes occurs, involve inhibitory collaterals through the corpus callosum (Hoptman and Davidson, 1994; Schuz and Perissel, 1996) and the dorsal hippocampal commissure (Gloor et al., 1993).

We have assumed that these rapid alterations of inhibition between patterns of activity within the two hemispheres and the resultant "temporal insulation" between the two hemispheres are characteristics of the normal periods of consciousness within which the sense of self and self-awareness are created. According to our model, the sensed presence is experienced when intercalation occurs between the neuroelectromagnetic correlates of the self involved with left hemispheric processes and its homologue generated by right hemispheric processes. During this brief period, the right hemispheric equivalent of the sense of self would be accessed by and integrated into left hemispheric processing. At this time, we are assuming that intrusion into awareness of this "parasitic consciousness" or "other" would be similar to those reported by many patients during the early stages of partial complex seizures initiated from limbic foci (Bancaud et al., 1994).

As predicted by the hypothesis of vectorial hemisphericity (Persinger, 1993), any experimental treatment that enhances this probability of coherence between the two hemispheric representations should also increase the incidence of the sensed presence. Certain metabolic asymmetries between the two cerebral hemispheres that encourage intercalation of activity between the hemispheres should also increase the probability of the occurrence of the sensed presence. These asymmetries include the intrinsic organization of the brains of people whose experiences are dominated by right hemispheric functions, changes in functional symmetry subsequent to mild brain injuries, and the reduced left prefrontal metabolism associated with many psychological depressions. Intrusion of this right hemispheric equivalent should occur during periods where the left hemispheric activity decreases relative to the right, such as during drowsiness and hypnagogic states or during periods of personal distress that are accompanied by release of endogenous electrogenic compounds such as corticotrophin releasing factor.

This experiment was designed to test the hypothesis that presentations of complex magnetic fields across the left and right temporoparietal regions equally or over the right hemisphere primarily should increase the incidence of a sensed presence relative to stimulation over the left hemisphere or to sham-field treatments. If the experimental treatment specifically affected the processes associated with the sensed presence from right hemispheric activity, then reports of more negative experiences (*e.g.*, apprehension or fear) but not of other sensations (*e.g.*, vibrations or visual imagery) should exhibit greater incidence.

Methods

Subjects

A total of 48 men ($N = 24$) and women ($N = 24$) 19 to 25 years of age participated in the study. All subjects preferred to use their right hand to write and to eat. The reinforcement for volunteering for the experiment was a 2% bonus mark for the final grade in a first year psychology course. These volunteers were told that the experiment involved relaxation, but were not told about the types of phenomena that may be experienced.

Procedure

Each subject was assigned in a sequential order to one of four successive treatments or groups: 1) sham field, 2) left hemisphere presentation, 3) right hemisphere presentation, and 4) bilateral presentation. Equal numbers of men and women were insured within each group. Each subject was tested singly, and no more than three subjects were tested per day. The consent to participate in the experiment indicated that the subject may or may not be exposed to a weak magnetic field with a strength less than that emitted by a hairdryer.

In order to facilitate relaxation, each subject was seated in a comfortable armchair that was housed within a commercial acoustic chamber. The subject's eyes were covered with goggles and a modified motorcycle helmet was placed over their head. On both sides of the helmet were four equidistant solenoids that were arranged in an elliptical pattern (Richards et al., 1993). Each solenoid on one side of the helmet was connected to the homologous solenoid on the other side of the helmet. More detailed descriptions of the equipment have been shown elsewhere (Richards et al., 1993).

Each subject was administered the Hypnosis Induction Profile as described by Spiegel and Spiegel (1978). This procedure involved instructions to relax and to imagine the left hand floating on a balloon. During this standardized procedure, the left hand was lightly touched several times by the experi-

menter (F. H.) who was not aware of the purpose of the experiment (she had been told that the experiment was involved with hypnotizability and relaxation). When the instructions for imagination had been completed, the experimenter instructed the subject to maintain that feeling. The chamber door was then closed. A lapel microphone allowed direct access to the experimenter if the subject decided to stop the experiment.

During the next 20 minutes, each subject received a complex magnetic field (Richards et al., 1993) with 3-msec point durations and 4-second interstimulus presentations primarily over the left hemisphere, primarily over the right hemisphere, or equally over both hemispheres. Each point was a value between 0 and 255 that was translated into a voltage. A repeated series of these points with different values composed the specific pattern. This pattern was generated from a computer through a custom-built digital-to-analogue converter. The electric current generated from this pattern of voltages was distributed successively for .5 seconds through each pair of solenoids (1 rotation = .5 Hz). The rotating distribution of this field was completed through a commutator. The sham-field condition consisted of activating all of the equipment except for the final switch (outside of the chamber) between the generating equipment and the helmet.

A sensor indicated no discernable fields generated between the solenoids within the space occupied by the subject's brain during the sham period. However, during activation of the fields, the strengths ranged between 100 nT near the midpoint between the sides of the helmet and 1 μT along the inside of the helmet during bilateral stimulation. During either right- or left-side stimulation, which was controlled by activating a switch directly on the helmet, the strength of the field on the activated side was about two to three times the value on the nonactivated side.

Following the 20-minute exposure, the subjects were asked to complete an exit questionnaire composed of 20 items (Persinger, 2000) representing the common experiences reported within this experimental context during stimulation by complex magnetic fields. Because two items were not relevant to the present study, they were not included in the data analyses. Each item contained an option for three scores: 0 = never; 1 = once; and 2 = several times. In order to accommodate the individual variability in capacity to introspect and to report imagery as well as the baseline for experiential content, the score for each of the 18 items was divided by the mean score of all 18 items. Because of the possibility that the same source of variance might affect the responses to several items, factor analysis (PA1 method) was completed. These factor scores were employed in a three-way analysis of variance with one within-subject level (factor scores for the items) and two independent or between-subject levels (sex, field condition).

TABLE 1
Means and SD for Responses[a] of Various Experiences Recalled after 20 Min of Treatment

Primary Experience of Item	Mean	SD
1. Dizzy or odd	.9	.7
2. Sensed presence	.5	.6
3. Tingling sensations	1.0	.7
4. Visual images	1.0	.8
5. Vibrations through body	.7	.8
6. Detachment or out-of-body	.5	.7
7. Anger	.2	.4
8. Sadness	.5	.5
9. Thoughts "not from own mind"	.3	.6
10. Ticking sounds	.4	.7
11. Odd smells	.2	.4
12. Fear or terror	.4	.6
13. Odd tastes	.1	.4
14. Felt as if somewhere else	.6	.8
15. Memories from childhood	.7	.6
16. Same thought kept repeating	.8	.8
17. Spinning or vortical experiences	.3	.5
18. Remembered a dream	.4	.6

[a] 0 = never, 1 = at least once, and 2 = several times.

To discern if the subjects' previous experiences of sensed presences, complex partial epilepticlike signs, the propensity to respond "yes" to items (general compliance), beliefs in conservative religious ideas (*e.g.*, second coming of Christ), or beliefs in exotic ideas (*e.g.*, aliens are responsible for UFO reports) were associated with the experiences reported during the experiment, scores for discrete clusters of items were extracted from the participants' Personal Philosophy Inventories (Persinger and Makarec, 1993), which had been administered in a class setting about 3 months before the experiment began. The experimenters did not know the individuals' profiles for these in-class questionnaires at the time of the treatments. All analyses were completed by SPSS software on a Vax computer.

Results

The means and standard deviations for the 18 items for the 48 subjects are shown in Table 1. Three-way analyses of variance with one within-subject level (18 items) and two independent treatments (hemisphere of application and sex) demonstrated a statistically significant difference between the averages for all of the scores as a function of treatment ($F[3,40] = 3.24$, $p < .05$; explained variance = 20%). The differences between sexes

TABLE 2
Means and SD for Scores for the Incidence of a Sensed Presence, Fear or Terror, Odd Smells, and Average for All Experiences as a Function of the Hemispheric Application of a Complex Magnetic Field

	Hemisphere							
	Sham (N = 12)		Left (N = 12)		Right (N = 12)		Bilateral (N = 12)	
Variable	M	SD	M	SD	M	SD	M	SD
Presence	.3	.5[a]	0	0[a]	.6	.8[b]	.8	.6[b]
Fear	.2	.4[a]	0	0[a]	.8	.7[b]	.7	.6[b]
Odd smells	0	0[a]	0	0[a]	.3	.5[b]	.3	.5[b]
M of 18 items	.4	.2	.3	.2	.6	.3	.6	.3

[a] *vs.* [b] = $p < .05$.

(F[1,40] = .01, $p > .05$) and the interaction between sex and treatment (F[3,40] = .22, $p > .05$) were not significant statistically. The differences in scores between items were significant (F[17, 680] = 7.29, $p <$ .001; eta squared = .15). The only other significant interaction occurred between the items and treatments (F[51, 680] = 1.39, $p < .05$; eta-squared = .10).

To discern the source of the interaction between items and treatments, two-way analyses of variance for the scores for each of the 18 items were completed. These analyses revealed statistically significant differences between the four treatments (df = 3,40) for only the experiences of a sensed presence (F = 3.67, $p < .05$; eta = .47), fear or terror (F = 5.68, $p < .01$; eta = .57), and odd smells (F = 3.17, $p < .05$; eta = .45). There were no statistically significant main effects or interactions for the other items. The means and standard deviations for scores for these items are shown in Table 2. Post hoc (Tukey $p < .05$) analysis indicated that the groups who had received the magnetic field stimulations predominantly over the right hemisphere or equally across both hemispheres reported more frequent presences and experiences of fear or terror relative to the group who had received the same stimulation over the left hemisphere.

Two-way analyses of variance as a function of treatment and sex for each of the 18 items indicated statistically significant group differences (df = 3,40) only for the relative ratings of a sensed presence (F = 4.19, $p < .01$; eta = .50), smells (F = 2.85, $p <$ .05; eta = .42), and fear (F = 2.98, $p < .05$; eta = .44). The means and standard errors of the mean for the two largest effects, sensed presence and fear, are shown in Figure 1. There were no statistically significant differences between sex (df = 1,40) or interactions between sex and treatment (df = 1,40).

Post hoc analyses indicated that the primary source of the sensed presence was its greater incidence in the group that received the bilateral stimulation compared to the group that received stimulation over the left hemisphere. The major source of the group differences for fear was between the

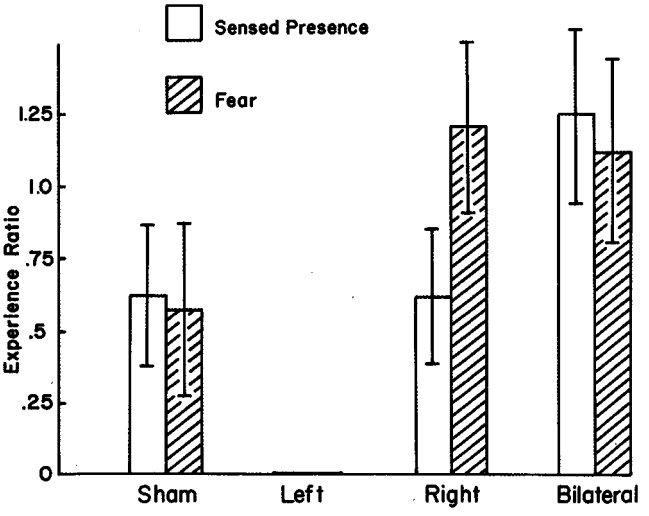

FIG. 1. Means and standard errors of the mean for the ratio of the incidence of sensed presences and fears relative to the average of all experiences during the experimental session as a function of treatment.

group that received right hemispheric stimulation relative to the left hemispheric stimulation group. Analysis of variance and covariance demonstrated that when the shared variance (r = .51 for raw scores, r = .36 for relative scores) between the scores for sensed presence and fear was first removed, the treatment differences for the incidence of sensed presences were still significant (F = 2.81, $p < .05$; eta = .41) while the prevalence of fear was not (F = 1.57, $p > .05$; eta = .30).

Factor analysis revealed six factors that, in combination, accommodated 67% of the variance in the responses to the 18 items. Standardized scores for only one of these six factors, the second factor (Eigenvalue = 2.20; 12% of the variance), demonstrated a statistically significant difference (F[3,44] = 3.12, $p < .05$) between the treatments. This factor was loaded significantly after varimax rotation by the sensed presence (r = .71), anger (r = .68), fear (r = .66), odd smells (r = .40), and experiences of a dream (r = −.51). The means, standard deviations, and standard errors of the mean (the

latter two in parentheses) for the *z*-scores for this factor for the treatments were as follows: sham field, −.40 (.69, .20); left hemisphere, −.40 (.54, .16); right hemisphere, .22 (1.2, .35); and both hemispheres, .57 (1.1, .33). Post hoc analyses (Tukey $p <$ .05) indicated that the primary source of the difference was between the group that received bilateral stimulation compared to the sham-field–exposed group.

When the scores were reduced to the experience of no presence *vs.* presence, the percentages of subjects (N = 12/treatment) who reported a presence were as follows: sham, 33%; left hemisphere, 0%; right hemisphere, 42%; and both hemispheres, 66% ($\chi^2[3] = 15.08$, $p < .01$; phi = .55). The percentages of subjects in each condition who reported fear during the experimental period were as follows: sham, 16%; left hemisphere, 0%; right hemisphere, 66%; and bilateral stimulation, 58% ($\chi^2[3] = 16.30$, $p < .001$; phi = .58). For the incidence of odd smells, neither the subjects in the sham-field group nor those in the left hemisphere condition reported this experience, while 33% of both the right hemisphere and bilateral hemisphere groups reported this experience ($\chi^2[3] = 9.60$, $p < .05$; phi = .44).

There were no statistically significant differences between the groups with respect to the major scales obtained from the Personal Philosophy Inventories (M [SD], respectively): complex partial epilepticlike signs, 43% (19%); compliance response, 81% (10%); history of sensed presence, 42% (37%); conservative religious beliefs, 39% (27%); and exotic beliefs, 68% (30%). There were no statistically significant correlations between the incidence of sensed presence and the subjects' scores for reports of traditional religious beliefs, exotic beliefs, or preexperimental sensed presences as inferred by clusters of items from the Personal Philosophy Inventory. The only statistically significant correlation between responses to the items following the experimental stimulation and the proclivity for temporal lobe sensitivity, as inferred by the scores from the cluster of items for complex partial epilepticlike signs (Persinger and Makarec, 1993), was with the incidences of experiencing memories attributed to childhood ($r = .48$, $p < .01$).

Discussion

The results of this study support the hypothesis that weak complex magnetic fields that were applied with a slightly higher intensity over the right hemisphere relative to the left or with equal intensity over both hemispheres can facilitate the experience of a sensed presence. Two thirds of the subjects who received the bilateral stimulation reported this experience. These results are consistent with, but not proof of, the hypothesis that stimulation that facilitates intercalation of specific neuroelectromagnetic patterns between the two hemispheres allows the awareness of the right hemispheric equivalent of the sense of self. This awareness is experienced as a sensed presence.

We (Persinger and Makarec, 1992) have suggested that such intercalation with the right hemispheric equivalent of the sense of self during maintained left hemispheric arousal, such as during creative states in the early morning hours (2:00–5:00 AM, when the person would typically be asleep), could be the source of the experience of the "Muses" or "guiding spirits" to which writers, poets, and musicians have referred for centuries. However, in these instances the anomalous persistence of left hemispheric activity during the early morning hours would allow the awareness of this particularly powerful intrusion that would be incorporated into the ongoing cognitive activity.

The specific influence of right hemispheric or bilateral stimulation upon the incidence of the sensed presence within our experimental setting was shown for the raw scores and for the relative scores for ratings of the frequencies of the experiences. The latter were analyzed to control for the potential nonspecific effects of a treatment upon all experiences. Results of the factor analysis indicated that the bilateral stimulation affected processes within the brain with which the experiences of the sensed presence, fear, odd smells, and anger were associated. The amygdaloid-hippocampal formation would be a primary candidate for the neural substrate for this cluster of experiences, which have been evoked by direct surgical stimulation within epileptic patients (Halgren et al., 1978).

We also suggest that this cluster of experiences, which was specifically enhanced when the complex field was applied bilaterally or with a slight right hemispheric enhancement, emphasizes the importance of the dorsal hippocampal commissure in the mediation of these experiences. If the pathways within the normal brain are similar to those revealed in limbic epileptics (Gloor et al., 1993), then stimulation of the right hippocampal formation and amygdala may evoke neuronal patterns that could enter the entorhinal cortices (parahippocampal gyrus) of the left hemisphere (and awareness) without first involvement of the right temporal lobe and corpus callosum. Hence, the sudden awareness of this "information" might be experienced as "not from the self" or "ego-alien."

If this process occurs, then the sensed presence and related experiences would more likely share the subjective characteristics of the ephemeral awareness of the consolidation of memory—*i.e.*, dreaming (Llinas and Pare, 1991)—than of the categorical perceptual experiences induced by normal sensory transduction. We have found that application of magnetic fields with a pulsed pattern that encourages LTP (long-term potentiation) in hippocampal slices to the human brain can affect semantic memory (Richards et al., 1996). The application of this LTP-inducing pattern over the right hemisphere also enhanced the intensity of experiences (Persinger et al., 1994). Consistent with this argument is the recent observation that illusory memories of a narrative can be induced by preferentially applying a burst-firing magnetic field (similar to the one employed in the present study) over the right hemisphere (Healey and Persinger, 2001).

Given the role of the hippocampal-amygdaloid system in experiences attributed to dreams, it is interesting that the item relating to "remembering a dream" was negatively loaded on the factor that was significantly affected by the application of the magnetic fields. One interpretation of the result is that if a presence is evoked during the period of hippocampal-mediated consolidation of memory, its characteristics may be amplified and it may be considered real rather than illusory.

A similar mechanism has been suggested for the increased incidence of bereavement apparitions between 2:00 and 6:00 AM during periods of enhanced geomagnetic activity (Persinger, 1988). The sensitivity of the right hemisphere either structurally or functionally to geomagnetic activity has been suggested by both correlational (Volchek, 1996) and experimental (Belisheva et al., 1996) data. Global geomagnetic activity is associated with intensities about 100 times weaker and with frequencies about 100 times lower than the ones employed in this study. However, these natural presentations can occur for hours rather than for only 20 minutes.

We do not have direct measurements that the magnetic fields employed in this study interacted with the neuroelectrical patterns generated within mesiobasal portions of the temporal lobes. However, the experimental design and equipment were selected because they have been demonstrated to produce differential entrainment of electroencephalographic activity (Persinger et al., 1997). The latency and specificity of both electroencephalographic and behavioral responses to the application of differently patterned magnetic fields are comparable with their direct affects upon dynamic processes within the neural structures or clusters of structures throughout the brain that support the temporal continuity of the complex neurogenic fields correlated with specific behaviors and experiences.

In one recent experiment (Persinger et al., 2000), we induced a powerful sensed presence that was coincident with paroxysmal electroencephalographic discharges over the right temporal lobe when a pattern specifically designed (not the one employed in this study) to affect electrical seizures within the entorhinal-hippocampal was applied over the right hemisphere. This sensitivity of a class of neural processes to weak complex magnetic fields may be more general than suspected. For example, posttraining exposure of rats to theta-burst patterns (microTesla) that induce LTP in hippocampal slices can significantly interfere with the consolidation of contextual but not discrete conditioned fear in rats (McKay et al., 2000).

Although we did not question the subjects in this study concerning the nature of the presence, we have found that individuals in other studies who have endorsed this item reported the presence of "someone else" in the closed, darkened chamber. About half of these subjects stated they (although blindfolded) felt "someone else" in the chamber and wondered how someone entered (because the double doors of the chamber had been closed before the experiment). Another approximately half of the subjects refer to a sentient being who moved when the subject tried to "focus attention" upon the presence. Of those subjects, about one third attributed the presence to a deceased member of the family or to some cultural equivalent of a "spirit guide." The latter may involve attributions to "alien or other-dimensional beings" that appear proximal to the experient within situations that can promote right hemispheric dominance (*e.g.*, dreaming or prolonged driving of an automobile).

We also did not obtain the relative position of the presence in the present study. In our other unpublished studies, where the subjects have been interviewed following these exposures and after the completion of the exit questionnaire, right hemispheric stimulation was associated primarily (more than 80% of the cases) with attribution of the experience to the left side of the body while bilateral stimulation was associated with experiences attributed to the right (35%) of the experient, directly behind (20%) the experient, or to the left (45%) of the experient. In one recent unpublished study where 15 subjects were asked to press buttons held throughout the experiment in their left and right hands, when fields were applied over the right hemisphere, about 70% of the button presses indicated left-localized experiences. The remaining proportion of presences

were distributed, almost equally, between the "right side" and "immediately behind" the experients.

In the present study, none of the subjects who received the same complex magnetic field over the left hemisphere reported this experience. These results suggest that the stimulation of the left hemisphere can prevent the hypothesized intercalation between the left and right hemispheres. One explanation for this effect might be related to the manner in which the left hemisphere responds to this particular pattern of stimulation. Persinger (1999b) reported quantitative increases in alpha activity over the left but not the right temporal lobes due to the stimulation of the left but not the right hemispheres by the same field pattern that was employed in the present study. This enhanced "mismatch" between the two hemispheres may have decreased the probability of the required electrophysiological conditions to promote the sensed presence.

There is also both experimental and clinical evidence that left hemispheric stimulation might decrease the occurrence of phenomena that require involvement of the right hemisphere. Tiller and Persinger (1994) found that exposure to right hemispheric stimulation and then left hemispheric stimulation by these weak, complex magnetic fields promoted suggestibility. However, the reversed order of presentation, left hemispheric stimulation followed by right hemispheric stimulation, was not effective.

For our patients who have sustained brain trauma from impacts of mechanical energy and who experience terrifying sensed presences, usually between 2:00 and 4:00 AM, activation of a vocal message (*e.g.*, voice clock) or a tape recorded message has been employed to quickly dissipate these unpleasant experiences. These interventions were derived from our hypothesis that weak, brief activations in the left temporal cortices due to processing of meaningful (semantic) auditory information produce the mismatch between the two hemispheres sufficient to attenuate the intercalation. Again, most of these experiences reported by the patients occurred along the left side of the experient and were accompanied by negative rather than positive affect (Persinger, 1993, 1994).

Although the sham-field group was not exposed to the experimental magnetic field, some of the subjects within this condition reported a sensed presence. According to our database, the mean and standard deviation for men ($N = 30$) and women ($N = 28$) exposed to sham conditions within this experimental setting for three different previous experiments (employing similar subject pools) were .1 and .4, respectively. That the sham group in this experiment reported a significantly higher incidence of a presence ($M = .3$, $SD = .5$) compared to these previous experiments would be consistent with the enhancement of right hemispheric activity (and increased probability of intercalation).

This may have been an "iatrogenic" feature due to the method of measuring suggestibility. Effectively, the result may have been a Heisenberg variant whereby measurement can influence and may even add to the resultant phenomena when procedures encouraging suggestibility have been present. However, the application of the magnetic fields still evoked a greater incidence of sensed presences when applied over the right hemisphere and diminished them substantially when applied over the left hemisphere. The likelihood that experimenter expectancy may have contributed to effects is unlikely because both the experimenter who interacted with the subjects and the subjects themselves were not aware of the hypotheses or the purpose of the experiment.

Spiegel's Hypnosis Induction Profile requires attention to the left hand both by the subject and by the experimenter who touches the left hand. In one of our pilot studies, subjects submersed either their left hands or their right hands and wrists in warm (40–42°C) water for 3 minutes before similarly patterned weak magnetic fields were applied over the right hemisphere. More (85%) of the experiences of a sensed presence were attributed to the left side for those subjects whose left hands had been immersed in the warm water before the treatment compared to those subjects whose right hands had been immersed in the water (65%).

Right hemispheric stimulation, such as that which occurs during monotonous chanting or singing within a group or in response to changing visual stimuli within the left visual field (*e.g.*, sitting near a warm fire in a fireplace), may explain the increased reports of sensed presences in these contexts without the application of weak, complex magnetic fields. Although the slight increased incidence of the sensed presence in the sham field group in this study (unlike other experiments) who also experienced the stimulation of the left hand (and presumably increased right hemispheric activation) was not as strong as the effects reported by the groups who received the specific transcerebral magnetic fields, the measurement of this enhancement emphasizes the minimal energy requirements required to increase the probability of the sensed presence within relatively mundane settings.

We have not attempted to refute or to support the absolute existence of gods, spirits, or other transient phenomena that appear to be prominent features of people's beliefs about themselves before and after

death. Such postulations of the existence of gods external to brain processes are empty hypotheses that cannot be refuted or supported. Their definitions imply nonphysical, infinite, nonspecific, and pervasive processes that can never be measured. However, we have shown that the experience of these phenomena, often attributed to spiritual sources, can be elicited by stimulating the brain with specific weak complex magnetic fields. These fields contain energies well within the range expected to be produced within the brain during these specific states.

The study of the specific temporal patterns of complex magnetic fields that interact with the neuromatrix and evoke the sensed presence may have important scientific and practical significance. The experiences of sensed presences attributed to God, Allah, or to their variants have often been interpreted as cosmic consent for the validity of personal and institutional beliefs as well as the execution of correlative behaviors (Slaver and Rabin, 1997). Religious beliefs, in large part reinforced by personal experiences of sensed presences, are a persistent and powerful variable in large-scale killings of groups who endorse the belief in one kind of god by other groups who define themselves by a belief in a different god (Persinger, 1987). Understanding of the neuroelectrical patterns that generate the sensed presence and the isolation of the multiple stimuli that provoke this experience may have survival value for our species.

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